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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/784,392
Filing Date: February 15, 2001
Appellant(s): PEDERSON ET AL.

Mr. Charles Q. Maney
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 13 April 2007 appealing from the Office action mailed 30 October 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Pre-Appeal Brief dated February 26, 2007

(3) Status of Claims

This appeal involves claims 1-43.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,544,359	Tada	8-1996
6,321,234 B1	Debrunner	11-2001

Gray, J. and Reuter, A. "Transaction Processing: Concepts and Techniques", Morgan-Kaufman, CA. 1993.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-9, 17-31, 34-35, 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada et al. (hereinafter "**Tada**" 5,544,359) in view of **Debrunner** (U.S. Patent US 6321234 B1).

As per claims 1, 21, 24 **Tada** discloses a method of performing a transaction in a database system, comprising:

receiving a transaction to be performed (Tada, col. 1, lines 23-27);

performing a flush of a transaction log from volatile storage to non-volatile storage by an access module (Tada, Fig. 5, col. 11, line 30 – col. 12, line 3, the flush operation S10 is performed before the end transaction procedure S14).

Tada does not explicitly disclose "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules".

Debrunner, however, teaches "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules" as the PLS containing log records describing a change to such as page are flushed before the end of the transaction (col. 9,lines 20-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of the cited references because

Debrunner's teaching would have allowed **Tada's** to reduce contention for the log semaphore and increases transaction throughput of the database server system as suggested by **Debrunner** col. 9, lines 25-26 and abstract.

As per claim 2, Tada further teaches issuing a request to flush the transaction log with a message sent (Tada, Fig. 5, step S06) to each access module for performing a last step of the transaction (Tada, Fig. 5, step 11), the last step performed prior to the end transaction procedure (Tada, Fig. 5, the last step of transaction S11 checks whether the logs are flushed before the end transaction procedure S14).

As per claim 3, Tada further teaches performing the flush of the transaction log in a data access step prior to the end transaction procedure to avoid performance of a transaction log flush in the end transaction procedure (Tada, Fig. 5, the flush S10 is performed before the end transaction procedure S14. Since the logs are flushed before the end transaction S14, S14 initializes the transaction end indication and avoids the flush again).

As per claim 4, Tada further teaches determining that the last step (Tada, Fig. 5, S11, S11-1) is being performed by all of the plurality of access modules involved in the transaction (Tada, col. 11, 46-55, step S11 and S11-1 determines whether all logs are flushed).

As per claim 5, Tada further teaches determining if the transaction log has been flushed before performing the end transaction procedure (Tada, Fig. 5, col. 11, lines 47-67, in figure 5, step 11 and S11-1 checks whether the log has been flushed before performing the end transaction procedure S14).

As per claim 6, Tada further teaches avoiding performance of a transaction log flush in the end transaction procedure if the transaction log has been flushed (Tada, Fig. 5, the flush is performed at step S10 which is before the end transaction step S14. S14 just initializes the transaction end indication and avoids the flush again).

As per claim 7, Tada further teaches performing database transaction, which inherently includes an implicit transaction (an implicit statement is a single SQL statement, a transaction performed in the database system inherently includes transaction that only involves a single SQL statement).

As per claim 8, Tada further teaches performing the end transaction procedure (Tada, Fig. 5, step S14), which follows execution of the transaction (Tada, Fig. 5, col. 11, lines 30-67).

As per claim 9, Tada further teaches skipping broadcast of a directive indicating commencement of the end transaction procedure to the plurality of access modules (Tada, Fig. 5, the end transaction procedure S14 skips the broadcasting, it just initialize the transaction end indication).

As per claim 17, Tada teaches all subject matters which corresponds to claim 1 and further teaches a plurality of storage media, the storage media comprising persistent storage and volatile storage (Tada, Fig. 4, col. 7, line 44 – col. 8, line 67).

Claim 18 is rejected on grounds corresponding to the reasons given above for claim 1.

As per claim 19, Tada further teaches the controller adapted to skip sending a directive to perform a transaction log flush if the controller determines that each access module has flushed the transaction log before commencement of the end transaction procedure (Tada, Fig. 5, step S11 and S11-1 determines whether logs are flushed, if flushed, not more flush afterwards).

As per claim 20, Tada further teaches a controller adapted to provide a flush directive (Tada, Fig. 5, S06) with a message to each of the access modules to perform a last step of the transaction before the end transaction procedure (Tada, Fig. 5, the end transaction procedure is S14).

As per claim 22, Tada and Gray teach all the claimed subject matters as discussed in claim 21, and further teach perform the end transaction procedure, wherein the end transaction procedure follows execution of the last step of the transaction (Tada, Fig. 5).

Claim 23 is rejected on grounds corresponding to the reasons given above for claim 9.

As per claim 25, Tada further teaches wherein writing the log to persistent storage comprises flushing the log (Tada, Fig. 5, col. 11, lines 30-67).

As per claim 26, Tada further teaches maintaining the log comprises maintaining a transaction log (Tada, col. 7, line 44 – col. 8, line 67).

As per claim 27, Tada further teaches performing the end transaction procedure, the end transaction procedure comprising writing an end transaction indication into the log (Tada, col. 11, line 65 – col. 12, line 3).

As per claim 28, Tada further teaches providing a directive with a message to perform a last step of a transaction and communicating the directive to the access modules, each access module responsive to the directive to perform a transaction log flush before performance of an end transaction procedure (Tada, Fig. 5, col. 10, line 9 – col. 12. line 3, step S06 issues a message to flush log, step S10 flushes logs, both operations are performed before the end transaction procedure S14); and determining if each of the access modules has performed a transaction log flush before start of the end transaction procedure (Tada, Fig. 5, col. 10, line 9 – col. 12. line 3, step S11 and S11-1 determines whether logs are flushed before the end transaction procedure S14);

the parsing engine adapted to avoid sending a broadcast directive to the access modules to cause performance of a transaction log flush during the end transaction procedure (Tada, Tada, Fig. 5, col. 10, line 9 – col. 12. line 3, since the logs are flushed before the end transaction procedure S14, S14 avoids broadcasting flush message again, it just initialize the transaction end indication).

Tada does not explicitly disclose "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules".

Debrunner, however, teaches "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules" as the PLS containing log records describing a change to such as page are flushed before the end of the transaction (col. 9,lines 20-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of the cited references because **Debrunner's** teaching would have allowed **Tada's** to reduce contention for the log semaphore and increases transaction throughput of the database server system as suggested by **Debrunner** col. 9, lines 25-26 and abstract.

As per claim 29, Tada further teaches performing the plural steps prior to performing the end transaction procedure, and wherein performing the flush of the transaction log comprises performing the flush of the transaction log in one of the plural steps (Tada, Fig. 5, col. 10, line 9 – col. 12, line 3, a plurality of steps S02 and S10 are performed before S14. S10 flushes logs).

As per claim 30, Tada further teaches performing, in each of the plural steps, access of relational table data stored in the database system (Tada, Fig. 5, col. 10, line 9 – col. 12, line 3, S02 read DB, S10 flush log access relation table data).

As per claim 31, Tada further teaches performing the flush of the transaction log in one of the plural steps comprises performing the flush of the transaction log in a last one of the plural steps (Tada, Fig. 5, step S10 perform flush, col. 10, line 9 – col. 12, line 3).

As per claim 34, Tada further teaches the access modules to perform a transaction comprising plural steps, one or more of the access modules adapted to perform the plural steps prior to the end transaction procedure, and the access modules adapted to perform the flush of the transaction log in one of the plural steps (Tada, Fig. 5, col. 10, line 9 – col. 12, line 3, step S10 flushes logs).

As per claim 35, Tada further teaches the one of the plural steps comprises a last one of the steps (Tada, Fig. 5, col. 10, line 9 – col. 12, line 3, step S11).

As per claim 38, Tada further teaches a controller to determine whether a last one of the steps involves all the access modules, and in response to determining that the last one of the steps involves all the access modules, the controller to send a

directive to all the access modules to perform the flush of the transaction log in the last one of the steps (Tada, Fig. 5).

As per claim 39, Tada further teaches in response to determining that the last step does not involve all access modules, the controller to send a directive to perform the flush of the transaction log in the end transaction procedure (Tada, Fig. 5).

Claims 40-41 are rejected on grounds corresponding to the reasons given above for claims 29-31.

3. Claims 10-16 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada et al. (hereinafter "Tada" 5,544,359) in view of Gray, J. and Reuter (hereinafter "Gray", Gray, J. and Reuter, A. "Transaction Processing: Concepts and Techniques", Morgan-Kaufman, CA. 1993).

As per claim 10, Tada discloses a method of performing an end transaction procedure in a database system, comprising:

After commitment of a transaction, a first access module in the database system writing an end transaction indication to a first transaction log portion in volatile storage, the first access module being part of a cluster of access module (Tada, Fig. 5, step S12, col. 11, lines 57-61; col. 10, lines 43-45 and 56-67; col. 9, lines 62-64.

Tada does not explicitly disclose the first access module sending an end transaction directive to a fallback module associated with the first access module, the fallback module being part of the cluster.

Gray, however, teaches the first access module sending an end transaction directive to a fallback module associated with the first access module, the fallback module being part of the cluster (Gray, page 34, 61-62, 562-576, 943, the end transaction directive will be sent to its replicated copy at the fallback module in a distributed processing environment).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Tada by incorporating a fallback module as disclosed by Gray (Gray, page 34) and sending an end transaction directive to the fallback module (Gray, page 562-576, 943). Because the fallback module stores a replicated data in other database, this provides continuous service even when one copy of data is corrupted, and sending an end transaction directive to the fallback module ensures the data in the fallback module is consistent with the primary copy of data. The ordinary skilled artisan would have been motivated to modify the database system of Tada for the purpose of be able to providing continuous service even when some data is corrupted.

As per claim 11, Tada and Gray teach all the claimed subject matters as discussed in claim 10, and further teach the first access module sends the end

transaction directive to the fallback module but not to other access modules in the cluster (Gray, page 34, 556-576, 592-609).

As per claim 12, Tada and Gray teach all the claimed subject matters as discussed in claim 10, and further teach sending the end transaction directive comprises sending an end transaction-part one directive (Gray, page 34, 556-576, 592-609).

As per claim 13, Tada and Gray teach all the claimed subject matters as discussed in claim 12, and further teach the first access module broadcasting an end transaction-part two directive to all access module in the cluster (Gray, page 34, 556-576, 592-609).

As per claim 14, Tada and Gray teach all the claimed subject matters as discussed in claim 10, and further teach the fallback module writing an end transaction indication to a second transaction log portion (Gray, page 34, 556-576, 592-609).

As per claim 15, Tada and Gray teach all the claimed subject matters as discussed in claim 10, and further teach the first access module flushing the first transaction log portion from volatile storage to non-volatile storage (Tada, Fig. 5, lines 11, lines 30-67, step S10).

As per claim 16, Tada and Gray teach all the claimed subject matters as discussed in claim 10, and further teach the first access module flushing the first transaction log portions but the other access modules in the cluster not flushing their respective transaction log portion (Gray, page 34, 556-576, 592-609).

As per claims 42-43, Tada and Gray teach all the claimed subject matters as discussed in claim 41, and further teach storing instructions for enabling a processor-based system to cause each access module to add a first entry to the transaction log to redo the transaction by the access module in case of system failure (Gray, 559-561, 567).

4. Claims 32-33 and 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tada et al. (hereinafter "Tada" 5,544,359) in view of **Debrunner** (U.S. Patent US 6321234 B1) and further in view of Gray, J. and Reuter (hereinafter "Gray", Gray, J. and Reuter, A. "Transaction Processing: Concepts and Techniques", Morgan-Kaufman, CA. 1993).

As per claim 32, Gray teaches all the claimed subject matters as discussed in claim 31, and further teaches each access module adding a first entry to the transaction log to redo the transaction by the access module in case of system failure (Gray, page 556-576, 592-609).

As per claim 33, Gray teaches all the claimed subject matters as discussed in claim 4, and further teach performing the flush of the transaction log in the end transaction procedure if the last step is not performed by all of the plurality of access modules (Gray, page 556-576, 592-609, commit_work flushes transaction log if the log is not empty/flushed).

As per claim 36, Gray further teaches the transaction log comprises a first entry associated with each access module to enable a redo of the transaction in case of system failure (Gray, page 556-576, 592-609).

As per claim 37, Gray further teaches all the claimed subject matters as discussed in claim 36, and further teaches a second entry associated with each access module to enable an undo of the transaction (Gray, page 556-576, 592-609).

(10) Response to Argument

Arguments(1): Regarding claims 1, 17, 21, 24, and 28

Appellant argues that Examiner concedes that Tada fails to teach a flush of a transaction log from volatile storage to non-volatile storage occurring before an end transaction directive is broadcast to a plurality of access modules. Likewise, while, as noted by the Examiner, Deburnner may teach a private log cache "containing log records(s) describing a change to ... a page [being] flushed before the end of the

transaction" (see, e.g., Debrunner, col. 9, lines 20-26), Applicant would like to respectfully point out that the above described flush of Debrunner is "from the private log cache of a task to the log page chain" which, pursuant to Debrunner, comprises flushing a log from volatile storage comprising the private log cache, "private log cache[] – a region of memory reserved for the particular database connection or 'user'" to volatile storage comprising the log page chain, "As shown in Fig. 2B, the system log or 'syslogs' comprises an in-memory page chain 280 including, for instance, log page 281 and log page 283), and not from volatile storage to non-volatile storage as required by Applicant's claims 1, 17, 21, 24, and 28. As such, neither Tada nor Debrunner, taken alone or in combination, teaches or suggests performing a flush of a transaction log from volatile storage to non-volatile storage before any directive indicating commencement of an end transaction procedure is broadcast to plural access modules as required by Applicant's claims 1, 17, 21, 24, and 28.

In response to the preceding arguments, Examiner respectfully submits that as an initial matter Debrunner was not cited for the teaching of the limitation "performing a flush of a transaction log from volatile storage to non-volatile storage by an access module"; but it was Tada's teaching that was cited for the above limitation. Therefore, Applicant arguments are irrelevant. The Final office action states as follows:

Tada teaches *performing a flush of a transaction log from volatile storage to non-volatile storage by an access module* as the content of the HLF buffer (114a) for the HLF-1 is transferred to the HLF buffer (112a) on the nonvolatile mass memory (103) for

the HLF-1 during the first loop (Tada, col. 11, lines 36-39 and Fig. 5, col. 11, line 30 – col. 12, line 3, the flush operation S10 is performed before the end transaction procedure S14).

Tada does not explicitly disclose "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules".

Debrunner, however, teaches "before any directive indicating commencement of an end transaction procedure is broadcast to the access modules" as the PLS containing log records describing a change to such as page are flushed before the end of the transaction (col. 9, lines 20-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of the cited references because **Debrunner's** teaching would have allowed **Tada's** to reduce contention for the log semaphore and increases transaction throughput of the database server system as suggested by **Debrunner** col. 9, lines 25-26 and abstract.

Arguments(2): Regarding claim 10

Appellant argues that claim 10 recites inter alia, a "method of performing an end transaction procedure in a database system, comprising: after commitment of a transaction, a first access module in the database system writing an end transaction indication to a first transaction log portion in volatile storage, the first access module being part of a cluster of access modules". As such, even if Tada disclosed the method recited by the Examiner, such disclosure would not be sufficient to teach the relevant

limitations of Applicant's claim 10. Further, Applicant argues that the Examiner has not pointed out, and Applicant is unaware of, any portion of Gray that teaches or suggests a method comprising, inter alia, **after commitment of a transaction, a first access module in the database system writing an end transaction indication to a first transaction log portion in volatile storage, the first access module being part of a cluster of access modules**, as required by Applicant's claim 10. As such, neither Tada or Gray, taken alone or in combination, teaches or suggests all of the limitations of Applicant's claim 10.

In response to the preceding arguments, Examiner respectfully submits that Tada teaches the limitation " **after commitment of a transaction, a first access module in the database system writing an end transaction indication to a first transaction log portion in volatile storage, the first access module being part of a cluster of access modules**" as the transaction end managing portion 118 detects the transaction end and records the transaction end in the transaction file 15 (col. 9, lines 62-64). Tada further teaches that step S06 is issue of the TRN-END (transaction-end) macro instruction. At this step, the TRN-END macro instruction is issued (col. 10, lines 43-45). Tada also teaches at step S07 is classification and transference of the log data. More specifically, the classifying portion 110 classifies and extracts the log data associated with the database (DB-1 (119a) or DB-2 (119b)) directed to the processing from the log data stored in the log data buffer 132. The extracted log data is transferred to the HLF buffer (114) in the main storage unit (101). More specifically, the log data

associated with the first database (DB-1) is transferred to the **HLF buffer (114a) (i.e., volatile storage**) for the HLF-1 during the first loop (col. 10, lines 56-67). The application program A reads the DB-1 out of the first external storage and ... when the application program C is initiated, the application program C issues a READ macro instruction (col. 2, lines 7-8 and 50-54). As such, Tada teaches the limitation as claimed, specifically it teaches writing an end transaction indication ... in volatile storage contrary to Appellant's arguments.

Tada does not explicitly disclose the first access module sending an end transaction directive to a fallback module associated with the first access module, the fallback module being part of the cluster.

Gray, however, teaches the limitation "a first access module sending an end transaction directive to a fallback access module associated with the first access module " as when a process checkpoints to its backup, the current list of transactions is included in the checkpoint, so that both members of the process pair are participants in the transaction. If the transaction aborts, or if the primary process fails, the terminal context is returned to its initial state (both the primary and backup have a copy of this) Page 942, second paragraph. Any participant of a transaction can call AbortTransaction(). This spawns a backout process, which flushes the log buffers of all disk servers and initiates an UNDO scan of the log Page 944, section Recovery Manager. Examiner submits that the combination of Tada and Gray would have arrived at the claimed invention.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

Conclusion

Claims 1-43 are properly rejected under 35 U.S.C. 103(a).

In light of the foregoing arguments, the Examiner respectfully requests the Honorable Board of Appeals to sustain the rejections.

Respectfully submitted,

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